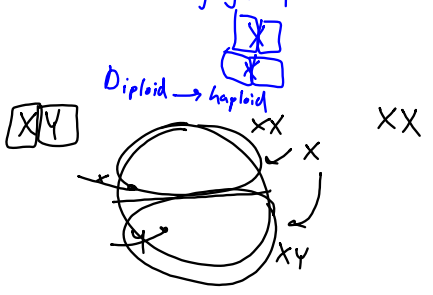
## Bellringer

→ What are two mechanisms that lead to genetic diversity in Meiosis?
crossing-over (prophase I) independent assortment fertilization

→ What is polyploidy? Give an example.
chromosome
XYY Jacobs
XXY Triploidy 2n = 4 Trisomy 21

→ What are the two laws of genetics that Gregor Mendel found to explain genetic diversity?
23
21st Law of independent assortment; metaphase I
Explain.
Law of segregation




XXY

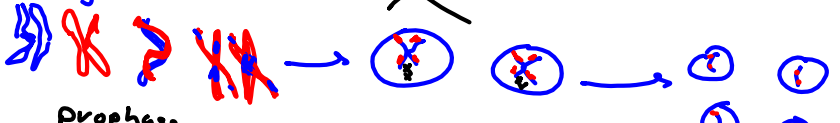
## Bellringer

→ What specifically happens during Meiosis that creates genetic diversity?

→ How is mitosis similar to meiosis? How is it different?
both create new cells
1/2 chromosome number → haploid
genetic diversity

Meiosis 2 + Mitotic Split

crossing over



prophase of Meiosis I

2nd assortment

1 trait
2 traits

Punnett Square

2 alleles = factors for a trait

T+

Capital = dominant = T
lowercase = recessive = +

2 alleles together = genotype
physical expression (i.e. tall/short) = phenotype

T = tall
+ = short

2 similar = homozygous
- homozygous dominant TT
- homozygous recessive ++

2 different = heterozygous T+
- 1 dominant, 1 recessive T+

One-trait

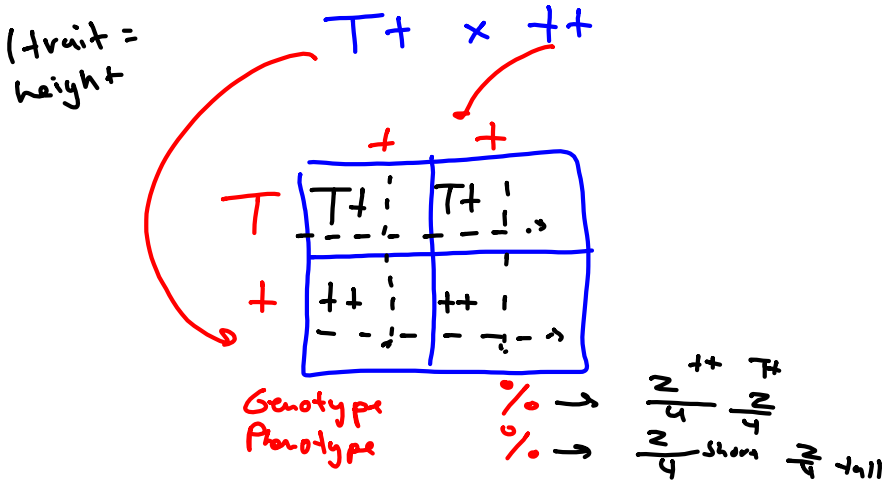
TT × ++

| | + | + |
|---|---|---|
| T | T+ | T+ |
| T | T+ | T+ |

T = tall
+ = short

100% genotype of T+
100% phenotype of tall

1 trait = height




2 traits

height

color

T = tall

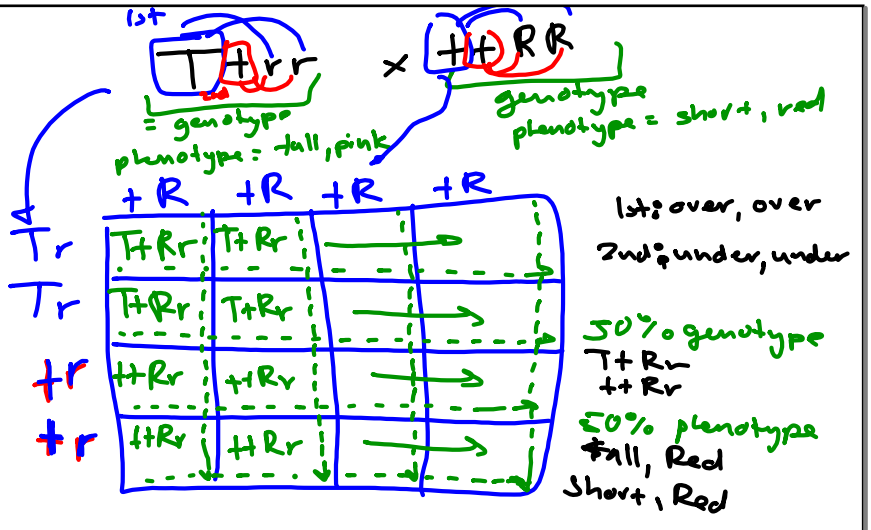
t = short

R = red

r = pink

1/16 gen %

1/16 phens %

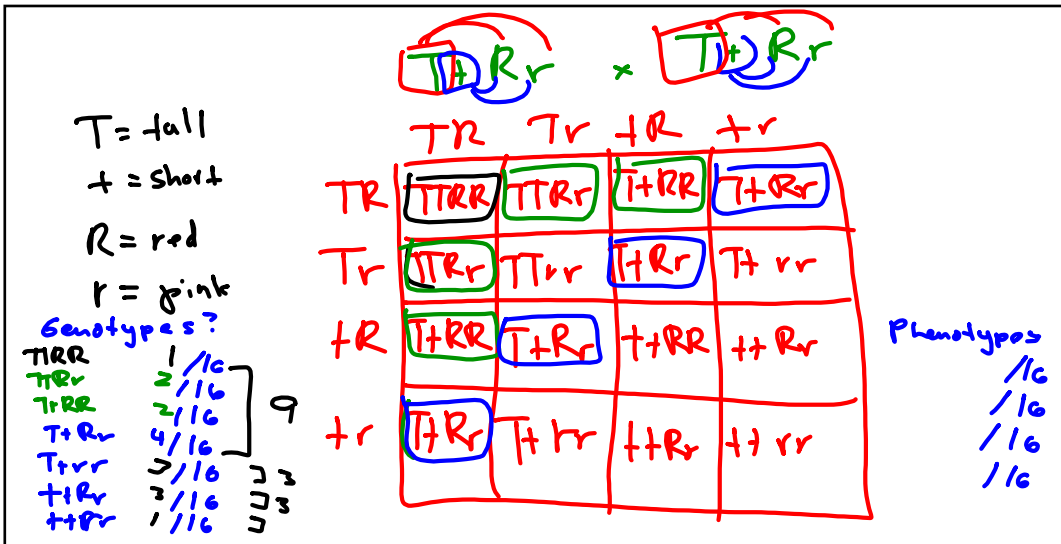


T = tall

t = short

R = red

r = pink




Genotypes?

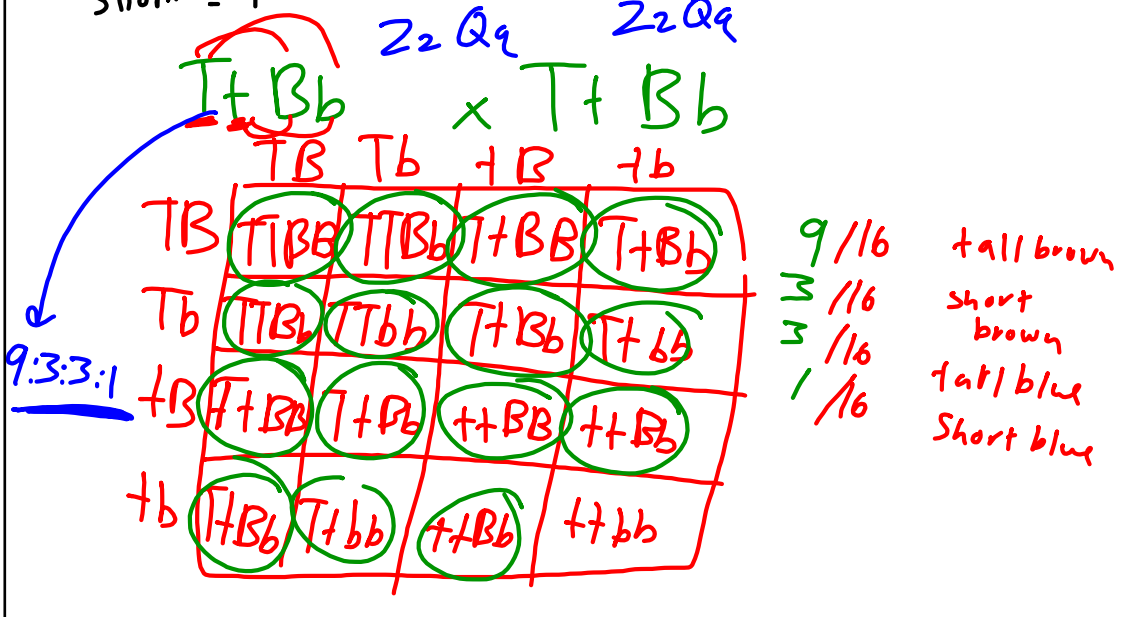
| | | |
|---|---|---|
| TTRR | 1/16 | |
| TTRr | 2/16 | 9 |
| TtRR | 2/16 | |
| TtRr | 4/16 | |
| Ttrr | 2/16 | 3 |
| ttRr | 2/16 | 3 |
| ttrr | 1/16 | 1 |

Tall = T

short = t

B = Brown

b = blue



## Bellringer

⇒ perform the following Punnett Square:

T = tall  W = White
t = short  w = tan

Tt ww x tt Ww

→ What are the % phenotypes possible?

Challenge: Using your Chi-square table, calculate the Chi-square statistic for this mating if the observed offspring #s are:

32 = tall white  48 = short white
52 = tall tan  68 = short tan

$\chi^2 = \sum \frac{(O-e)^2}{e}$

So e of 50

★ n−1 for degrees freedom ★

| | Tw | Tw | tw | tw |
|---|---|---|---|---|
| tw | TtWw | TtWw | ttWw | ttWw |
| tW | | | | |
| tw | | | | |
| tW | | | | |

4/16 tall white 25%
4/16 tall tan 25%
4/16 short white 25%
4/16 short tan 25%

$\frac{(32-50)^2}{50} + \frac{(52-50)^2}{50} + \frac{(48-50)^2}{50} + \frac{(68-50)^2}{50} = \chi^2 = 13.12$

7.81 < 13.12

## Bellringer

→ Solve the testcross TtBb x TtBb

★ Where ★

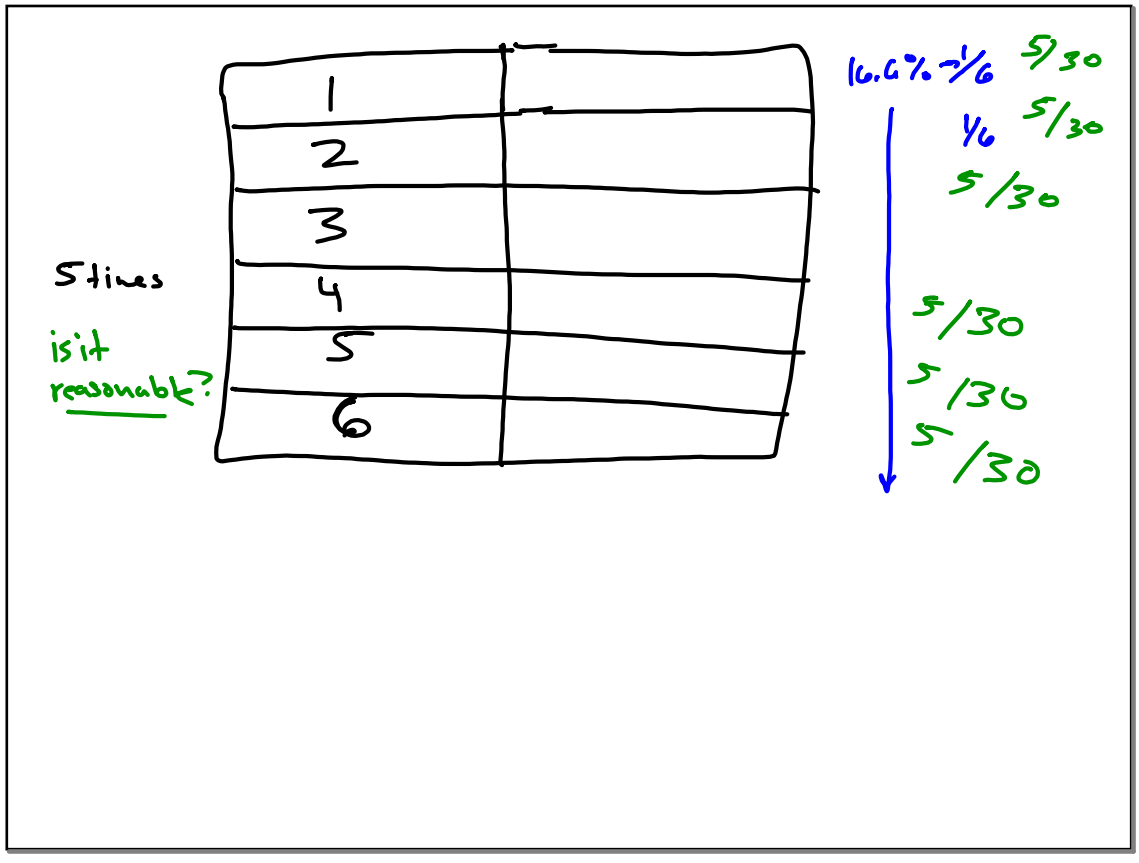
T = tall
t = short
B = brown
b = tan

| | TB | Tb | tB | tb |
|---|---|---|---|---|
| TB | TTBB 1 | TTBb 2 | TtBB 3 | TtBb 4 |
| Tb | TTBb 2 | TTbb 5 | TtBb 6 | Ttbb 7 |
| tB | TtBB 3 | TtBb 6 | ttBB 8 | ttBb 9 |
| tb | TtBb 4 | Ttbb 7 | ttBb 9 | ttbb 10 |

Tall Brown 6
Tall tan 6
Short brown 2
Short tan 2
16

$\sum = \frac{(O-E)^2}{E}$

→ What are the phenotypic ratios?




95% confident

df = degrees freedom (# of observations − 1) n−1 df

Chi-square analysis

$\sum = \frac{(O-E)^2}{E}$ (sum of)

O = observed
E = expected

summation of % error

5/30 → 1/6

| Chi square stat | |
|---|---|
| 1.99 | 11.070 |

1 2 3 4 5 6

.16 .0 1.5

$\frac{(5-6)^2}{6} + \frac{(6-6)^2}{6} + \frac{(4-6)^2}{6} + \frac{(6-6)^2}{6} + \frac{(9-6)^2}{6} + \frac{(6-6)^2}{6}$

0 0 0

Bellringer

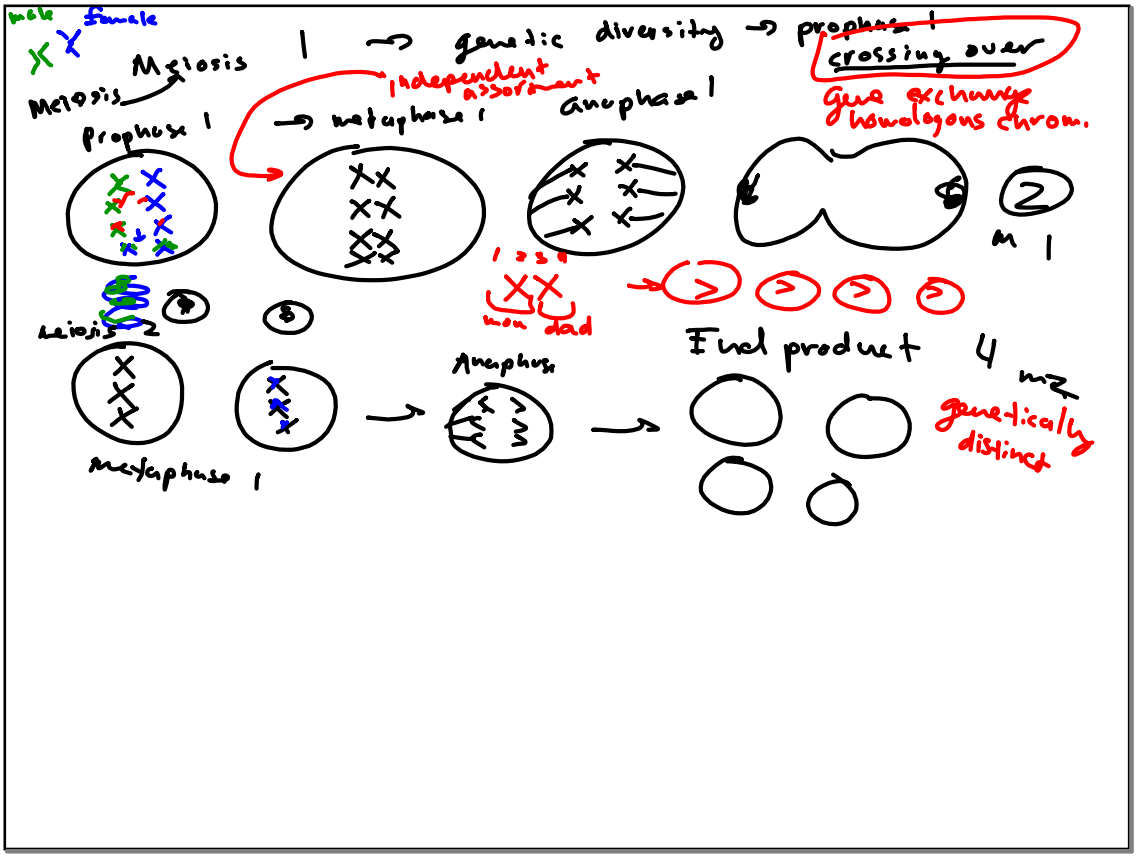
→ Describe the process of Meiosis. How does it work? What leads to genetic diversity? What is the final product? What's the cell like?

Meiosis → SEX → Genetic diversity

making sex cells

males sperm | females egg

½ normal # of chromosomes (23 pairs of chromosome) 46



# Meiosis & Mendelian Genetics Review

Grade: 10th

Subject: Biology

Date:

1 When two cells with n number of chromosomes fuse, what type of cell results?

2n = diploid

2 During which process are gametes formed?

fertilization

3 What process results in an exchange of genes between homologous chromosomes?

crossing over

4 How many chromosomes would a cell have during metaphase I if it has 12 chromosomes during interphase?

A 6
B 12
C 24
D 36

5 What happens after metaphase II during meiosis?

A they will experience replication
B they will experience fertilization
C their number per cell will be halved
D they will divide into sister chromatids

6 Which is not a characteristic of homologous chromosomes?

A homologous chromosomes have the same length
B homologous chromosomes have the same centromere position
C Homologous chromosomes have the exact same type of allele at the same location
D homologous chromosomes pair up during meiosis I

7 If a black guinea pig (Bb) were crossed with a white guinea pig (bb) what would the resulting phenotypic ratio be?

A 0:1 black to white
B 1:0 black to white
C 1:1 black to white
D 3:1 black to white

8 Polyploidy has been used in agriculture to increase the size of flowers.

True
False

9 Crossing over and independent assortment produce genetic recombination.

True
False

10 Which does not contribute to genetic variation?

A chromosome number
B crossing over
C meiosis
D random mating

11 Which concept is considered an exception to Mendel's law of independent assortment?

A crossing over
B gene linkage
C polyploidy
D law of segregation

12 A housefly, has six pairs of chromosomes. If two houseflies are crossed, how many possible types of fertilized eggs coul result from the random lining up of the pairs?

A 256
B 1024
C 4096
D 16,384

Equation = $2^n$

$64 \times 64$

13 For a housefly with six pairs of chromosomes, how many possible combinations of gametes can be produced by the random lining up of pairs in meisosis?

A 32
B 48
C 64
D 120

14 An organism that has the same two alleles for a trait is said to be homozygous.

15 An organism that has two different alleles for a trait is said to be heterozygous.

16 An organism's allele pairs is called its genotype.

17 The physical expression of an organism's alleles that code for a trait is the organism's phenotype.

18 The man considered to be the father of Genetics, who experimented with pea plants, is _____.

Gregor Mendel

↓

Mendelian Genetics

19 The process by which one haploid gamete combines with another haploid gamete is called _____.

fertilization

20 The law of _____ states that two alleles for each trait seperate during meiosis.

segregation

21 The occurence of one or more extra sets of chromosomes in an organism is called _____.

polyploidy

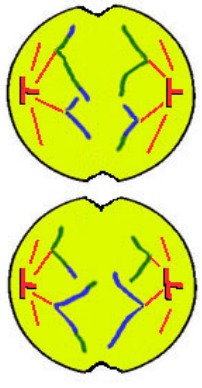
haploid → 1n
diploid → 2n

22 The DNA on chromosomes are arranged in segments called genes that control the production of proteins.

23 This is anaphase 2 of meiosis:

True

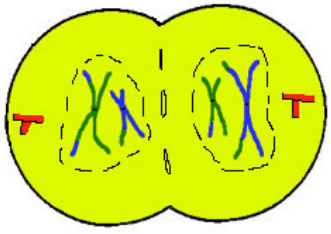
False



24 This is metaphase 1 of meiosis:

True

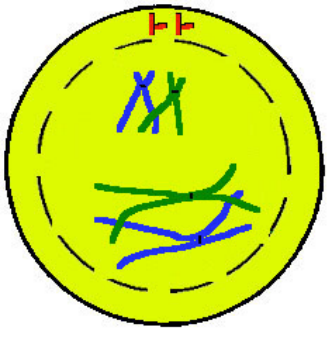
False



25 This is prophase 1 of meiosis:

True

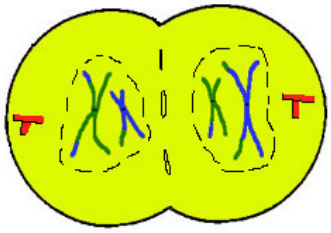
False

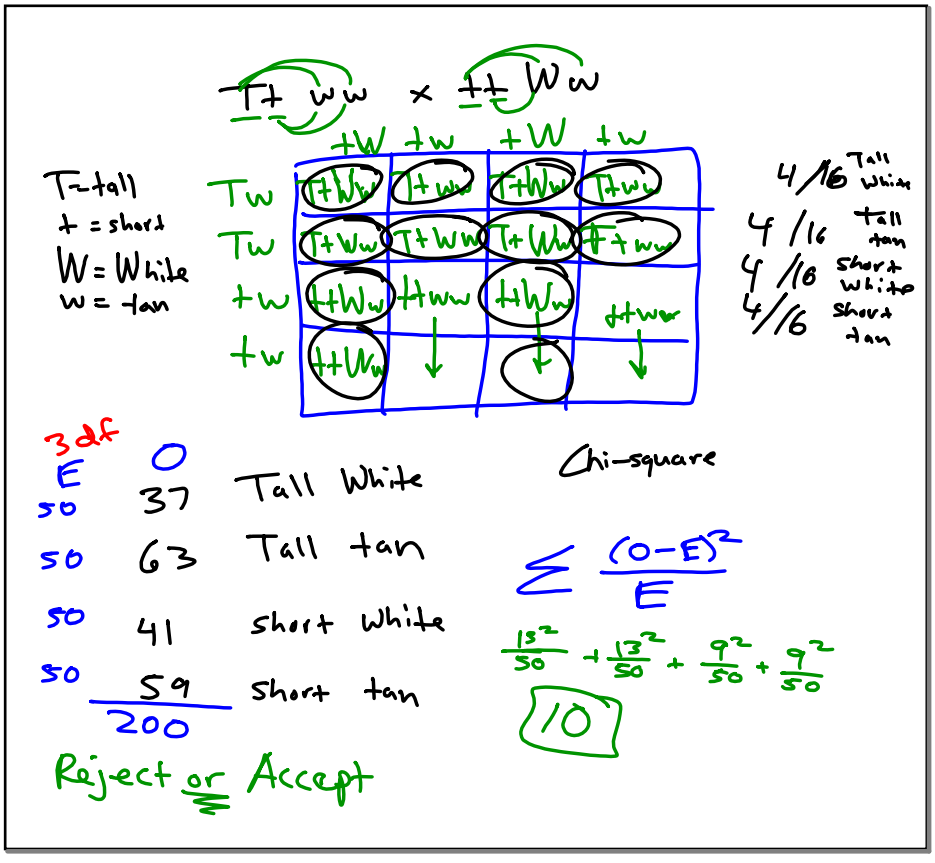


26 This is telophase 2 of meiosis:

True

False



# Know for the test:

- ☆ Meiosis → steps of Mitosis I and Meiosis II
- ☆ Punnett Squares
- ☆ Polyploidy → $2^n$ (old gene) + $2^n$ (fertilized)
- ☆ Review vocab